
...Algae Dominated
Non-indigenous species as threats to coral reefs

Hawai'i Coral Reef Initiative

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Management Committee

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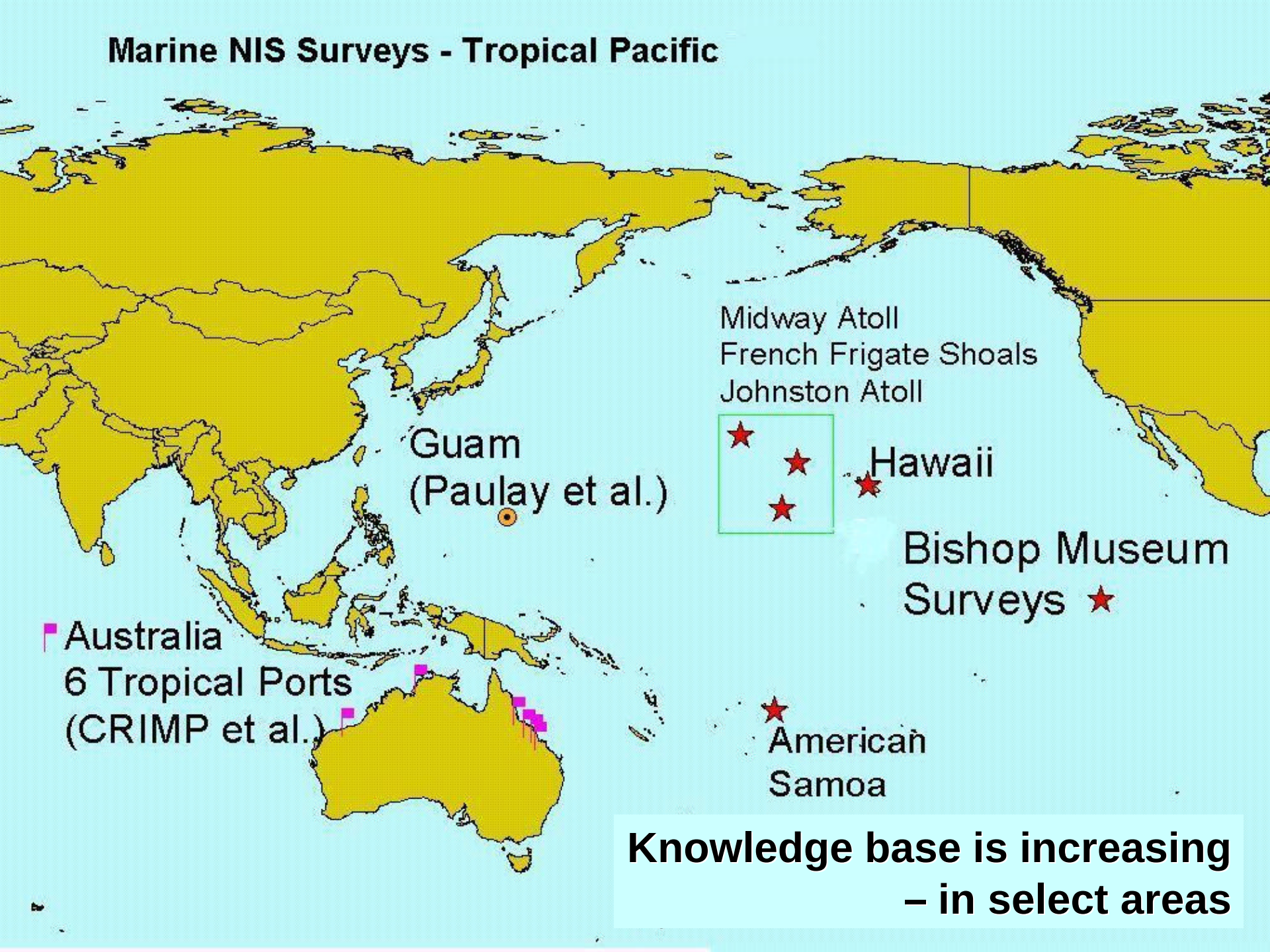


Knowledge base is increasing – in select areas

MARINE ALIEN SPECIES SURVEYS – TROPICAL PACIFIC

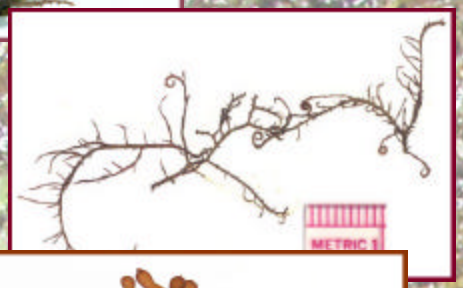
Region	Total Nonindigenous	Total Species	% Nonindigenous
Hawaii			
• O'ahu			
➢ Pearl Harbor	95	419	23.0
➢ S & W Shores	100	585	17.0
➢ Waikiki	52	749	6.9
➢ Kuapa Pond	58	317	18.0
• Midway	4	444	1.5
• Kaho'olawe	3	298	1.0
• French Frigate Shoals	2	622[1]	0.3
Johnston Atoll	10	668	1.5
Guam			
• Apra Harbor	46	682[2]	6.7
• Islandwide	80	4,635	1.7
Australia			
• 12 Ports (Queensland)	30	------	-----
• Hay Point Port	12	506	2.4
• Mourilyan Harbour	4	401	1.0
• Abbot Point	5	593	0.8
• Lucinda Port	11	480	2.3

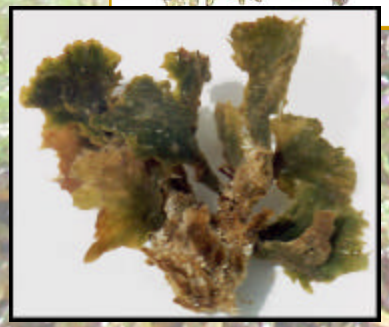
1 Marine Invertebrates Only

2-Sponges, Echinoderms and Ascidians Only

TRANSPORT MECHANISMS FOR MARINE NONINDIGENOUS SPECIES: MARINE INVERTEBRATES

Mechanism	Species	% Established
Hull Fouling	212	90
Solid Ballast	21	90
Ballast Water	18	89
Intentional Release: Fishery	18	28
Parasites on Nonindigenous Species	8	88
Associated with Commercial Oysters (Unintentional)	7	100
Aquarium Release	3	67





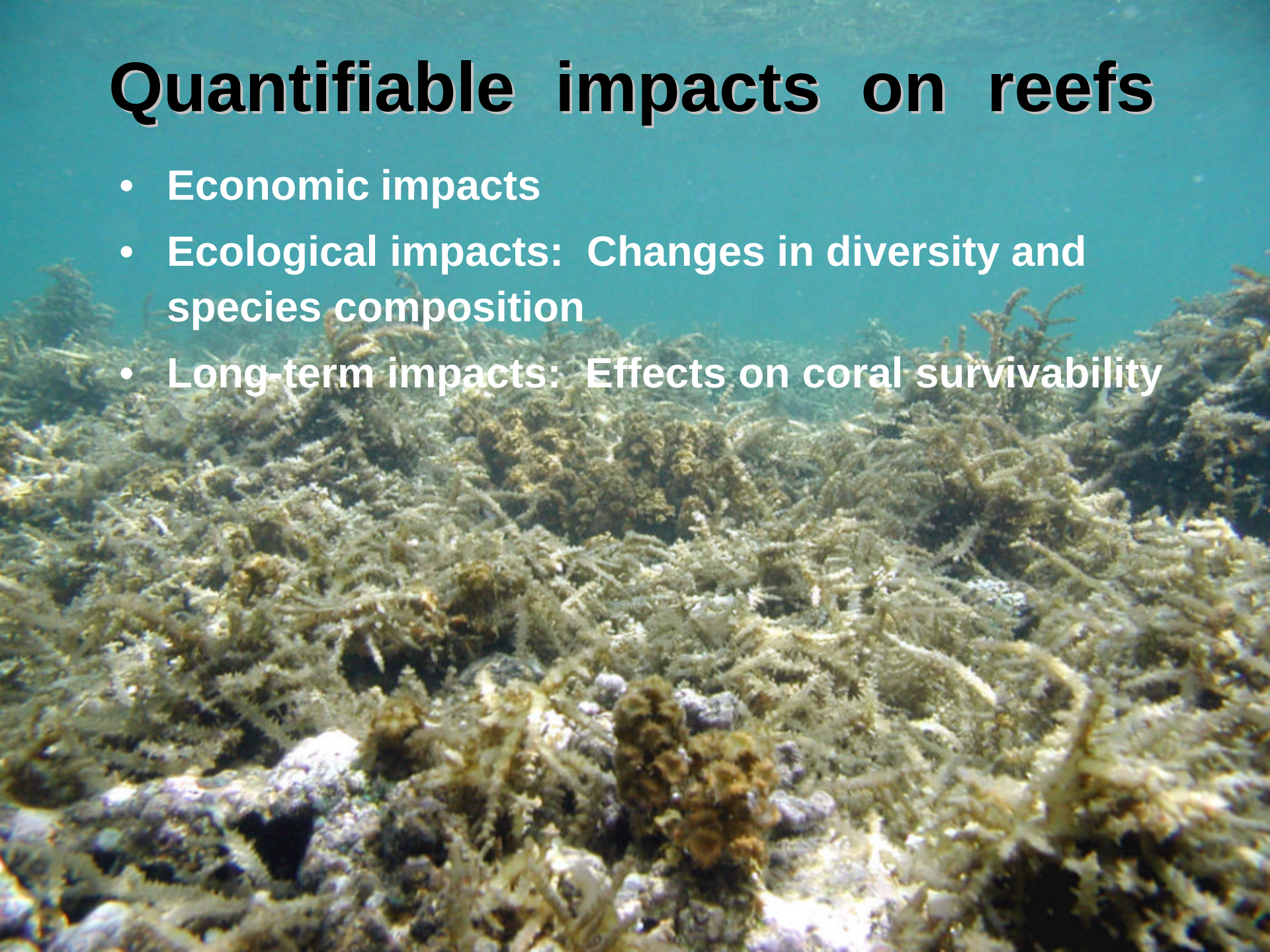
ANS* in Hawai'i: who, when, where and how?

Species	Year	Origin	Vector
Acanthophora spicifera	1950	Guam	Hull Fouling - Accidental
Hypnea musciformis	1974	Florida	Aquaculture - Intentional
Gracilaria salicornia	1971	?, Native to W Pacific, Indian Ocean, Australasia	Aquaculture - Intentional
Kappaphycus sp.	1974	Philippines	Aquaculture - Intentional
Avrainvillea amadelpha	1981	Native to W Pacific	Unknown

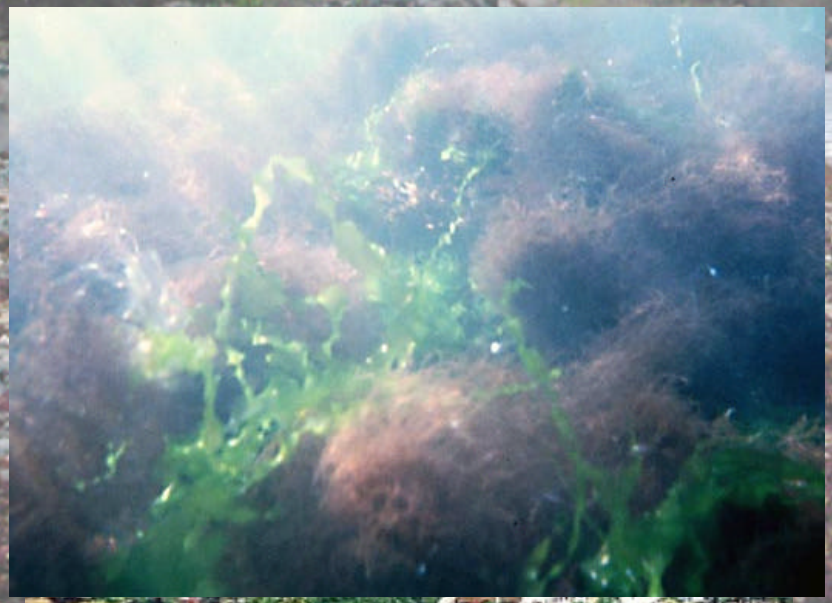
* Alien nuisance seaweeds

Quantifiable impacts on reefs

- Economic impacts
- Ecological impacts: Changes in diversity and species composition
- Long-term impacts: Effects on coral survivability



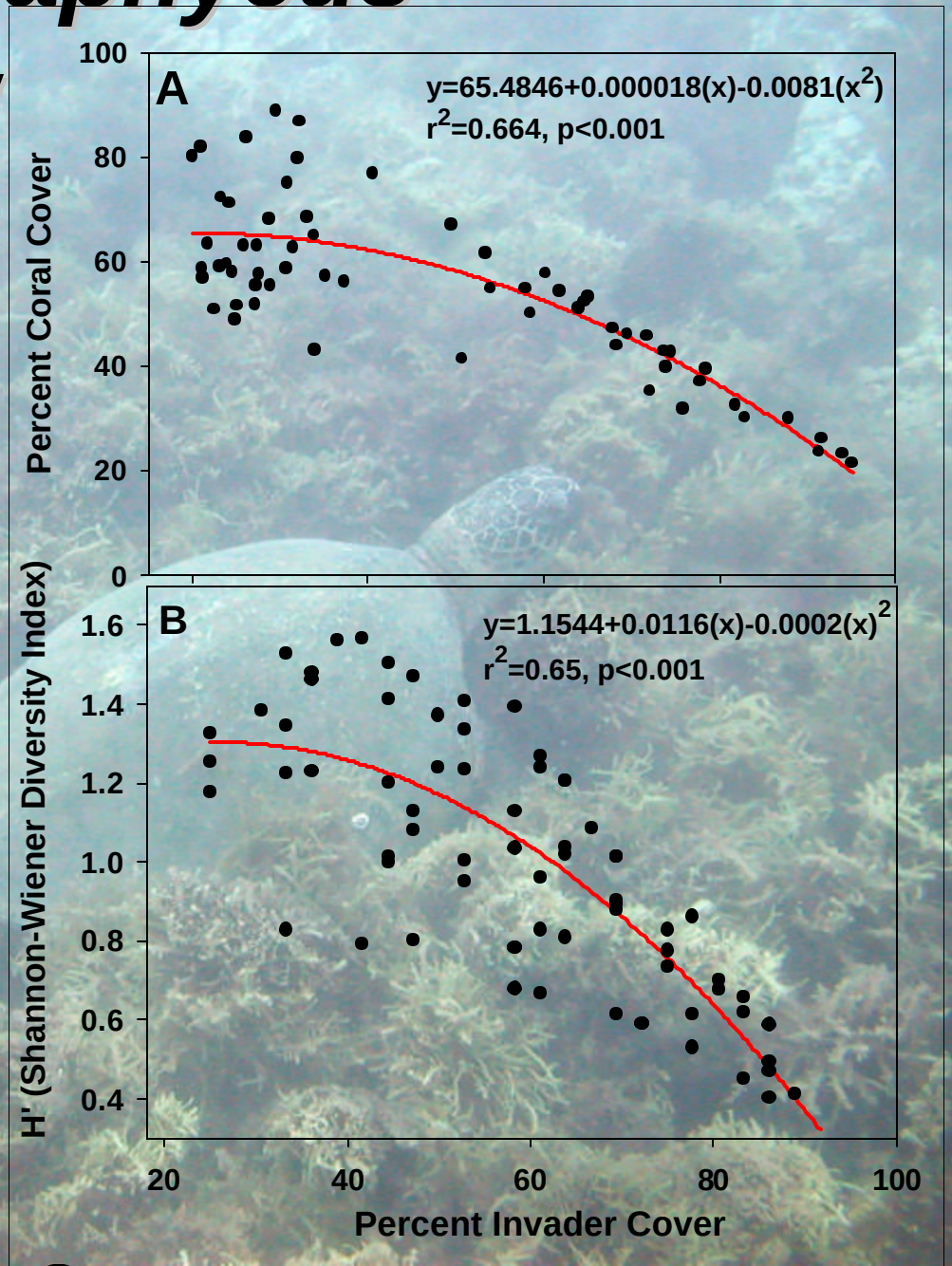
Impacts of *Hypnea musciformis* on Maui

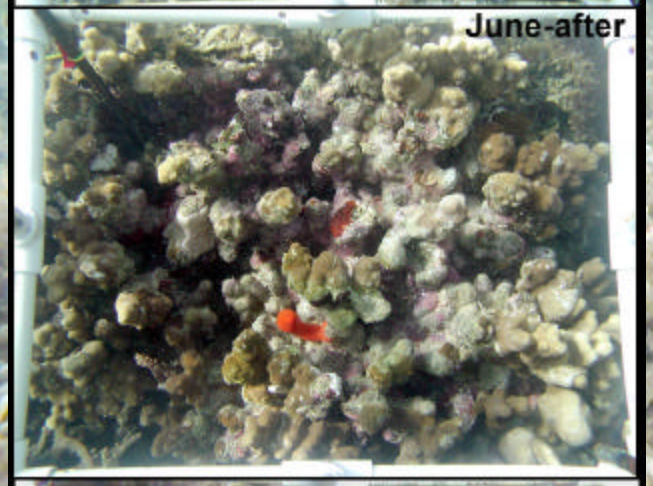


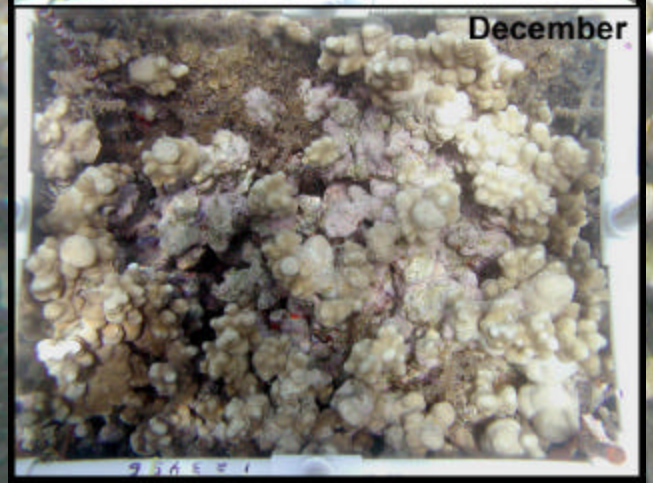
- 20,000 lbs of algae wash up on Kihei beaches / week
- >$100,000 / yr to clean beaches
- Economic study – algal biomass in north Kihei cost more than $20 million / yr
  - Loss in rental income, decrease in property values & clean-up
- Ecological impacts - smothering and overgrowth

Impacts of *Kappaphycus* in Kane'ohe Bay

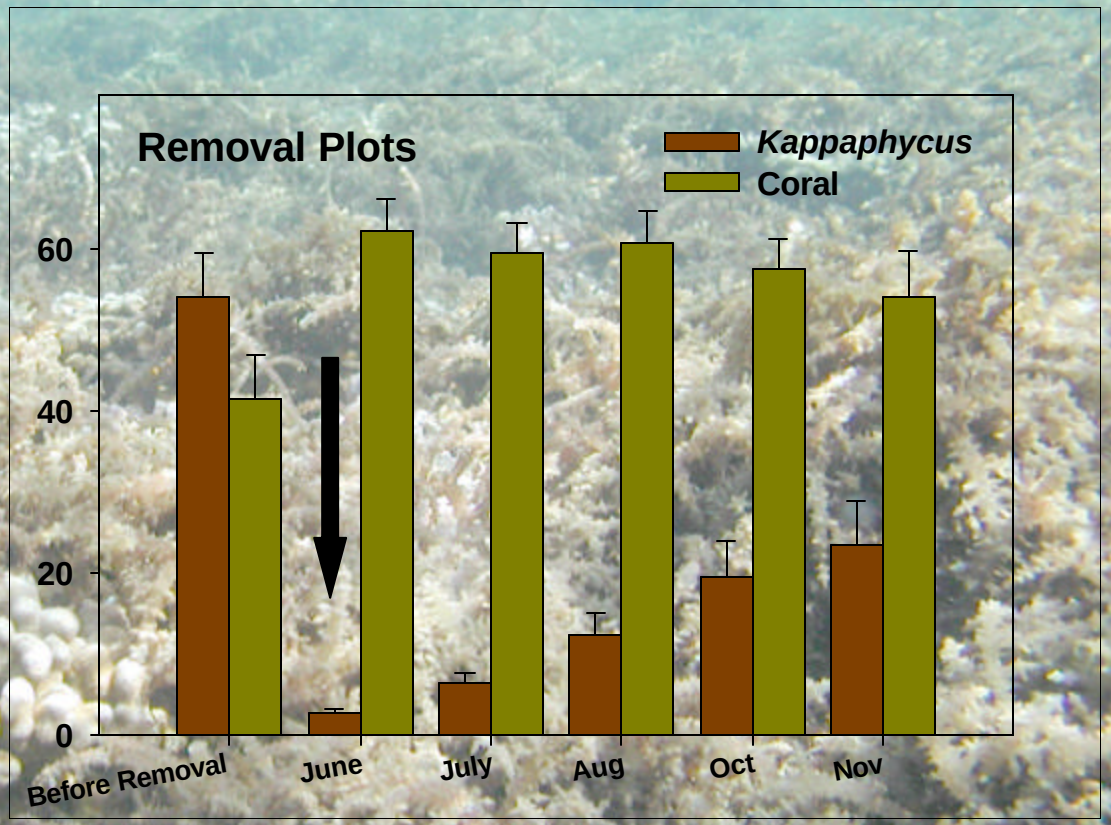
- *Kappaphycus* abundance is significantly correlated with lowered diversity & coral cover
- N=72 plots



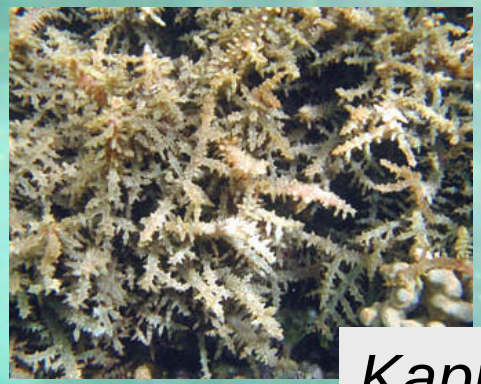


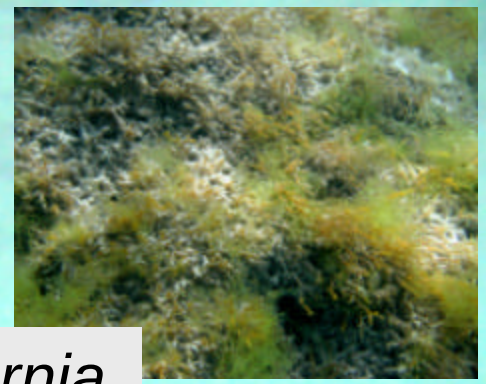


Kappaphycus Removal

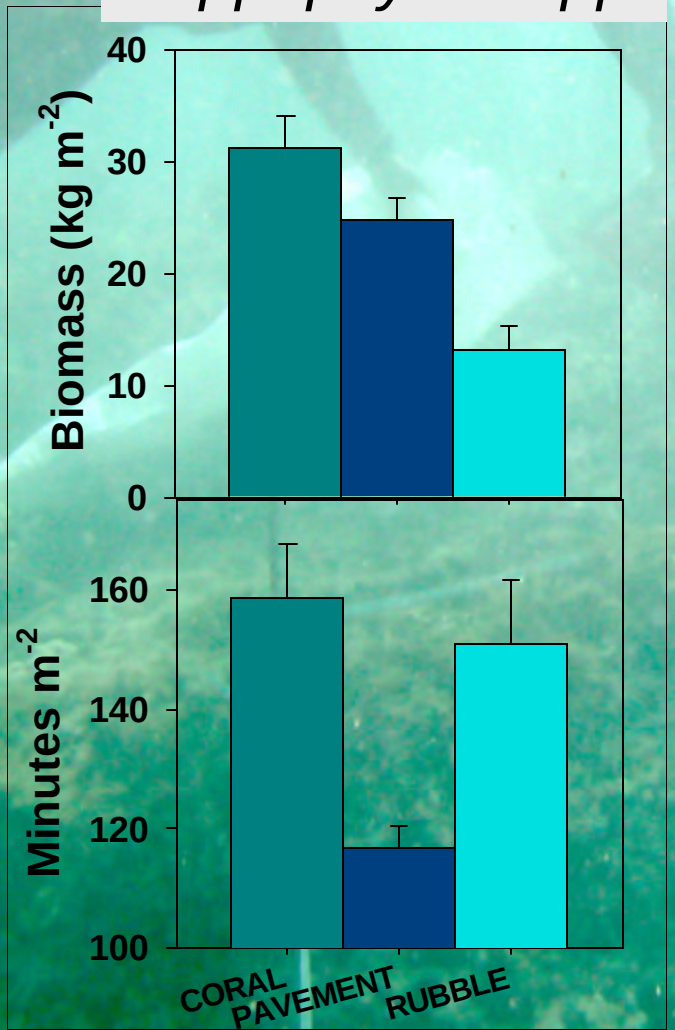


Manual Removal

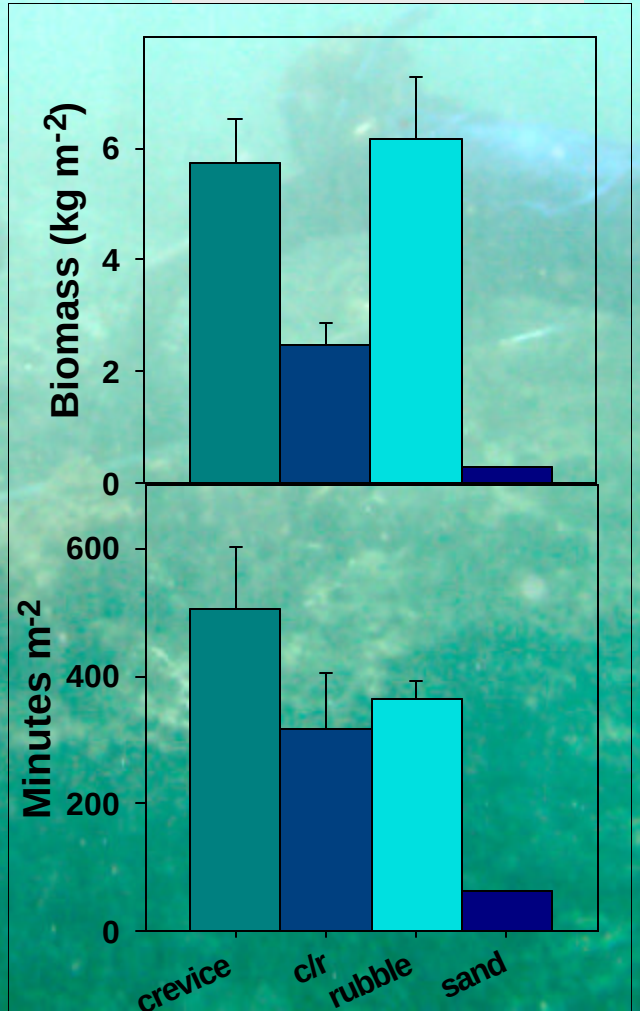




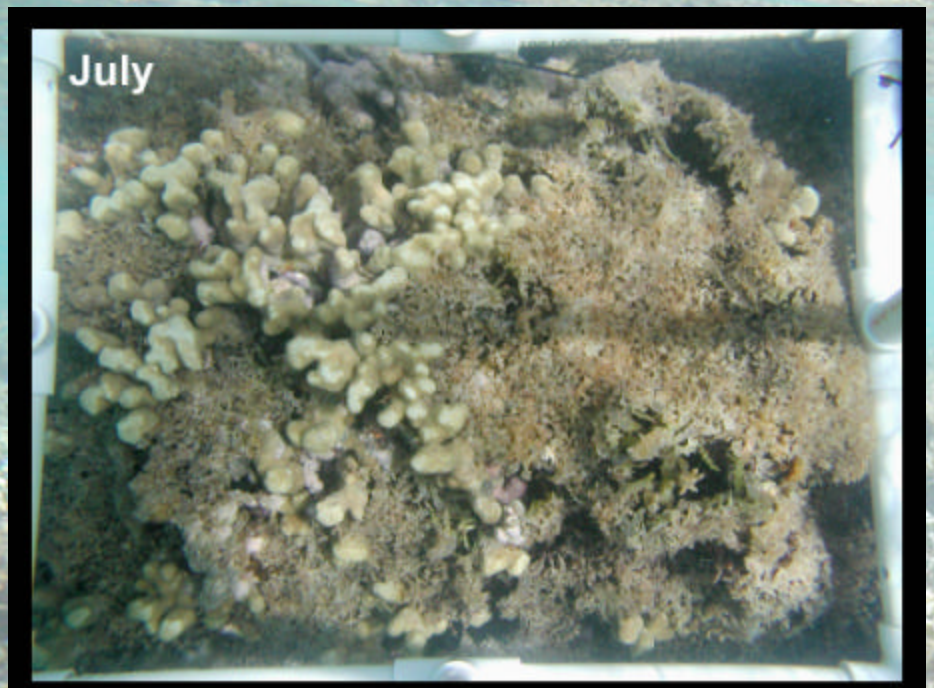
Kappaphycus spp.

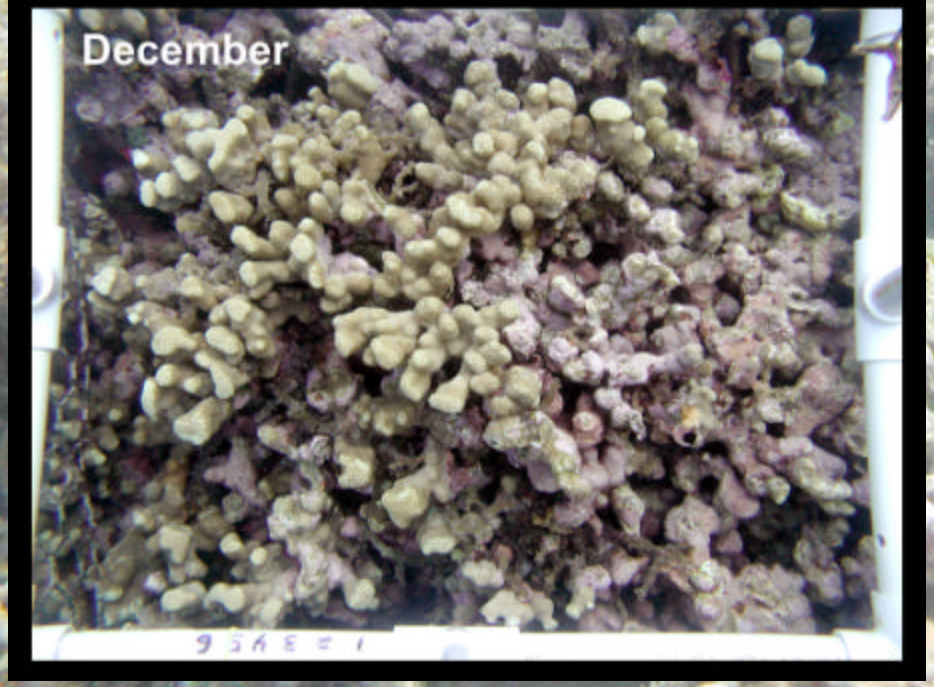


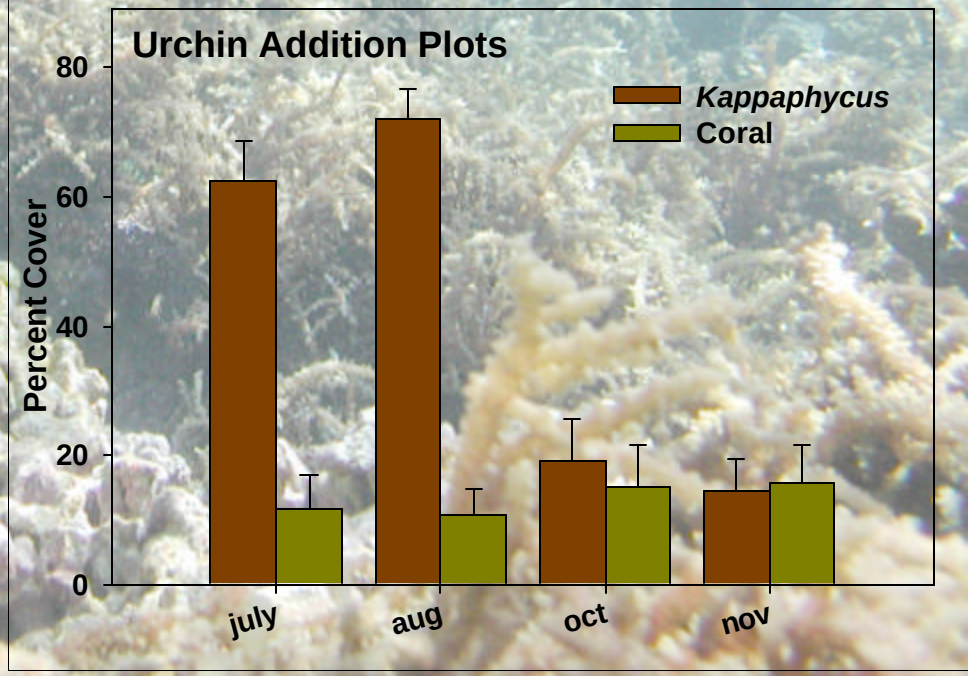
G. salicornia



Adding Urchins

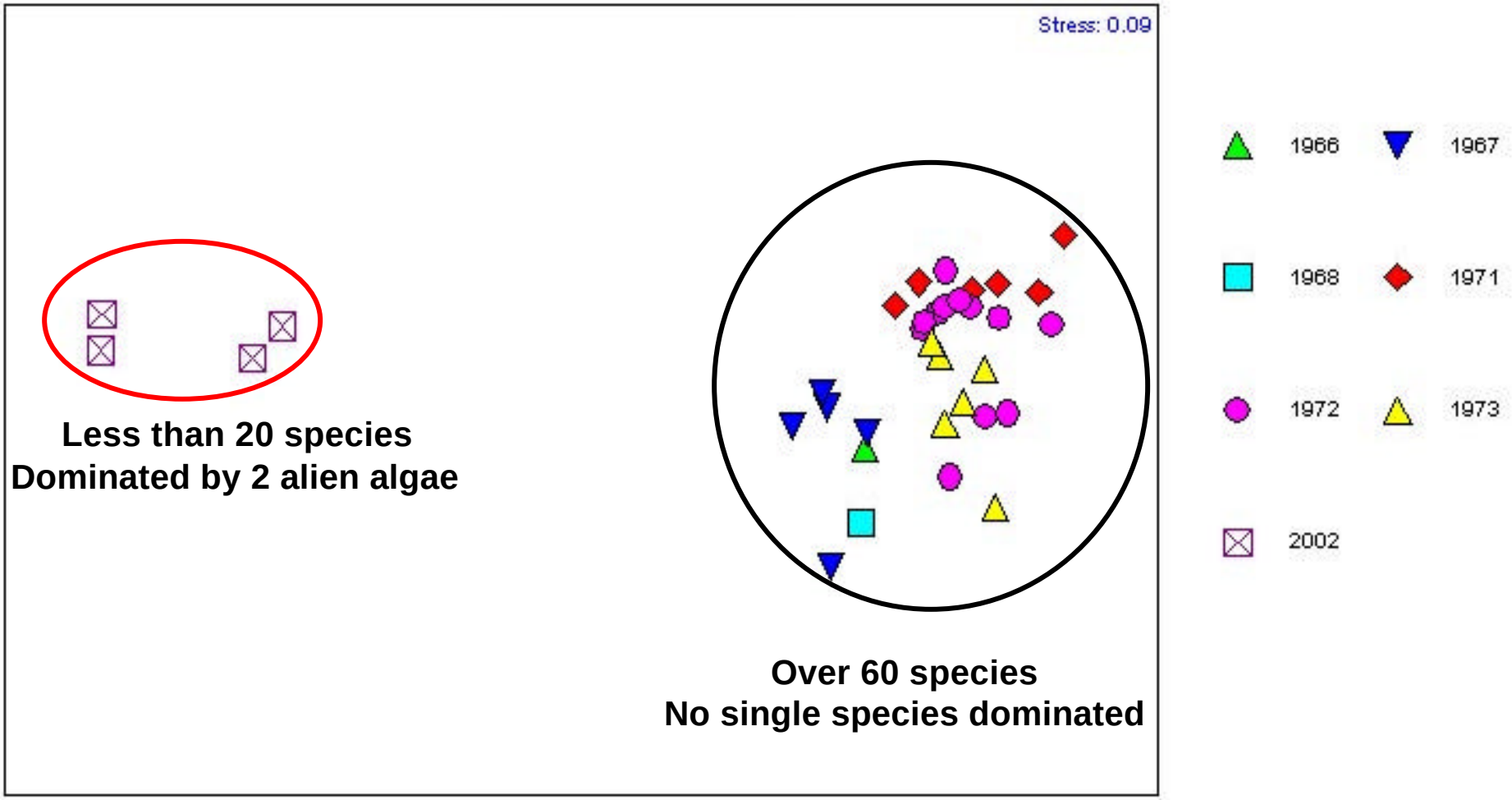




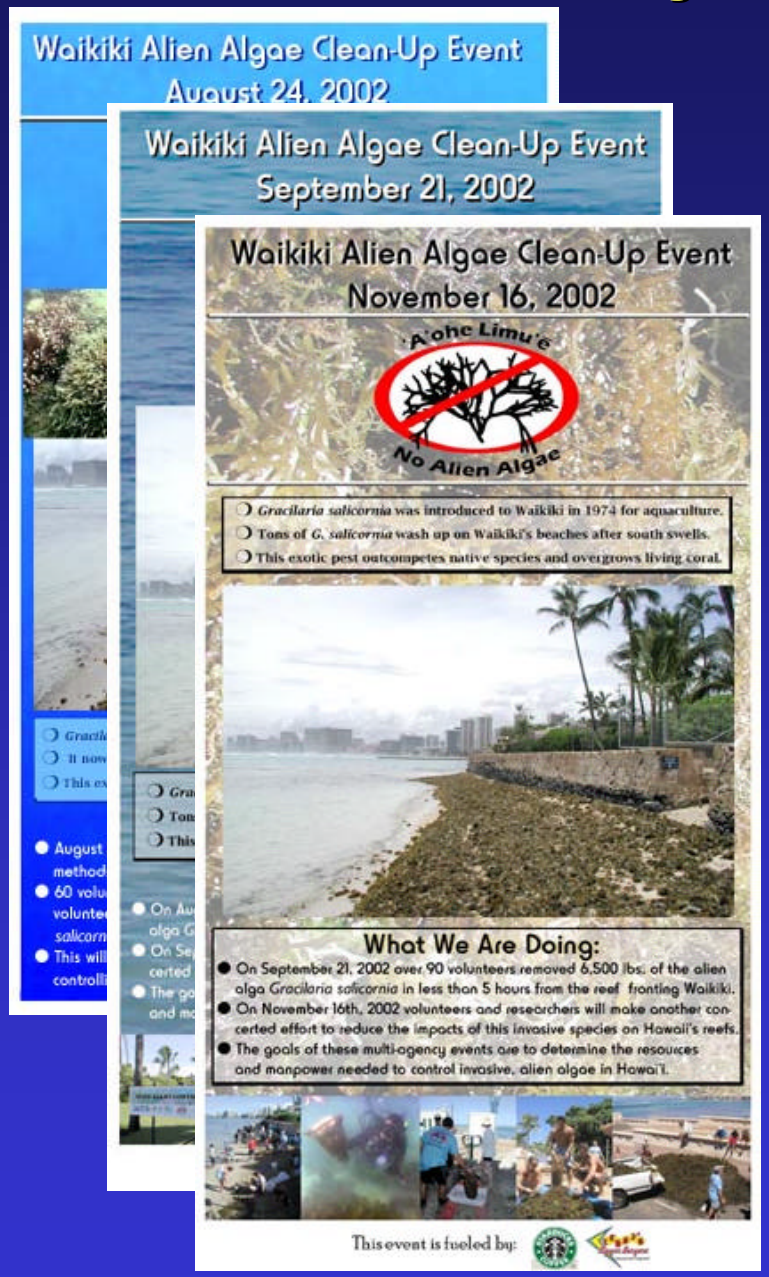


Impacts of *Gracilaria salicornia* in Waikiki

MDS Plot: *Changes in Community Structure on Waikiki's Reefs*



Community and Volunteer Training

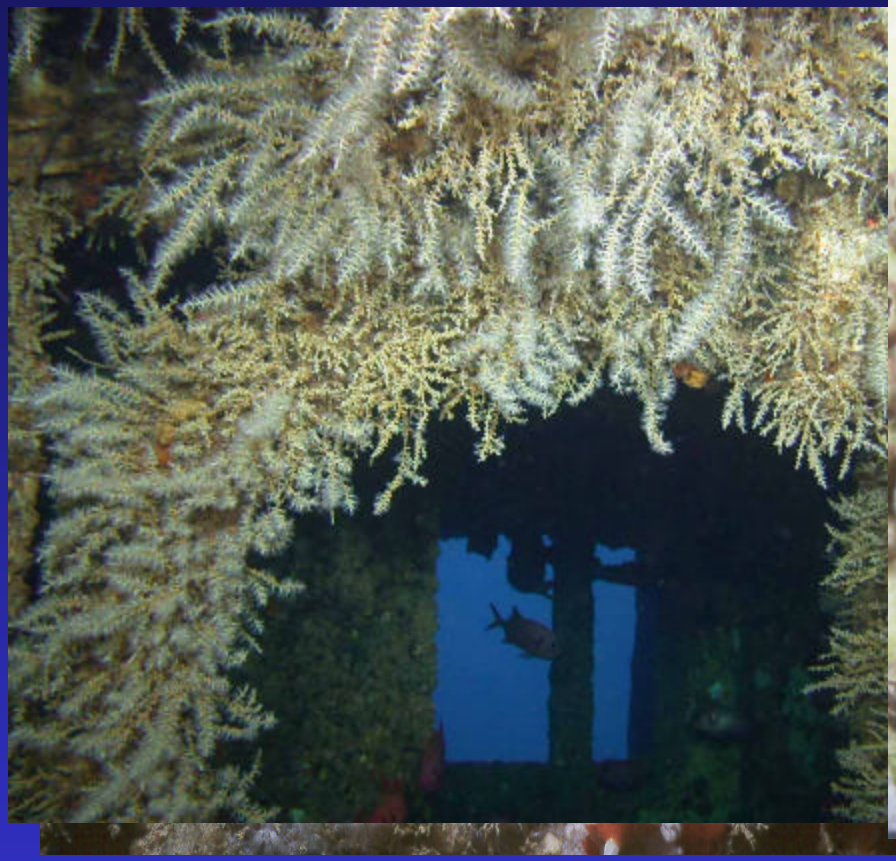


- Alien algae clean-up events
  - 3 in Waikiki
  - 2 Events in Kane'ohe
- Informational booth with brochures and algal displays
- Organized in conjunction with:

HCRI RESEARCH PROGRAM · COASTAL OCEAN PROGRAM · DAR · The Nature Conservancy of Hawai'i · REEF CHECK · WAIKIKI AQUARIUM

- Multi-agency partnership formed with the goal of reducing impact of alien algae in Hawai'i

Invertebrate species



Carijoa (=Telesto) riisei

on 100 ft Waikiki Wreck; threatens precious corals

Gelliodes fibrosa

Chthamalus proteus

Pennaria disticha **at Tern Is.**

in Northwestern Hawaiian islands

BISHOP MUSEUM

Checklist
Marine Invertebrates of the Hawaiian Islands

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Hawaii Biological Survey, Bishop Museum, Honolulu, Hawaii

This compilation was initiated in the mid-1960s as a 3x5 card file in an attempt to keep track of the marine biota of the Hawaiian Islands. The information has been used, in part, to assemble the "How many species are there in Hawaii?" series which appears in the Records of the Hawaii Biological Survey annually and the "Reef and Shore Fauna" series. Periodicals, books, and reports beginning as early as the late 1700s have been reviewed, as has been Zoological Record.

The Invertebrate Checklist can be viewed in a static outline form arranged in phylogenic order grouped by major taxonomic level, or it can be searched by phylum, class, order, family, species, bigeographic status (i.e., native or introduced), general habitat, and location. In search mode, the literature references which report the species in the Hawaiian Islands are listed. References are not shown in the outline view. Follow the "outline" link to view a summary table of major invertebrate taxa found in the Hawaiian Islands.

The list is still considered to be preliminary, and comments and suggestions for additions and revisions are encouraged. The Checklist will be updated periodically. Special thanks go the Charles H. and Margaret B. Edmondson Trust for partial support to develop this website. Please contact L. G. Eldredge [psa@bishopmuseum.org] with your comments.

Search the checklist
Run simple query on taxa, status, location, and habitat.

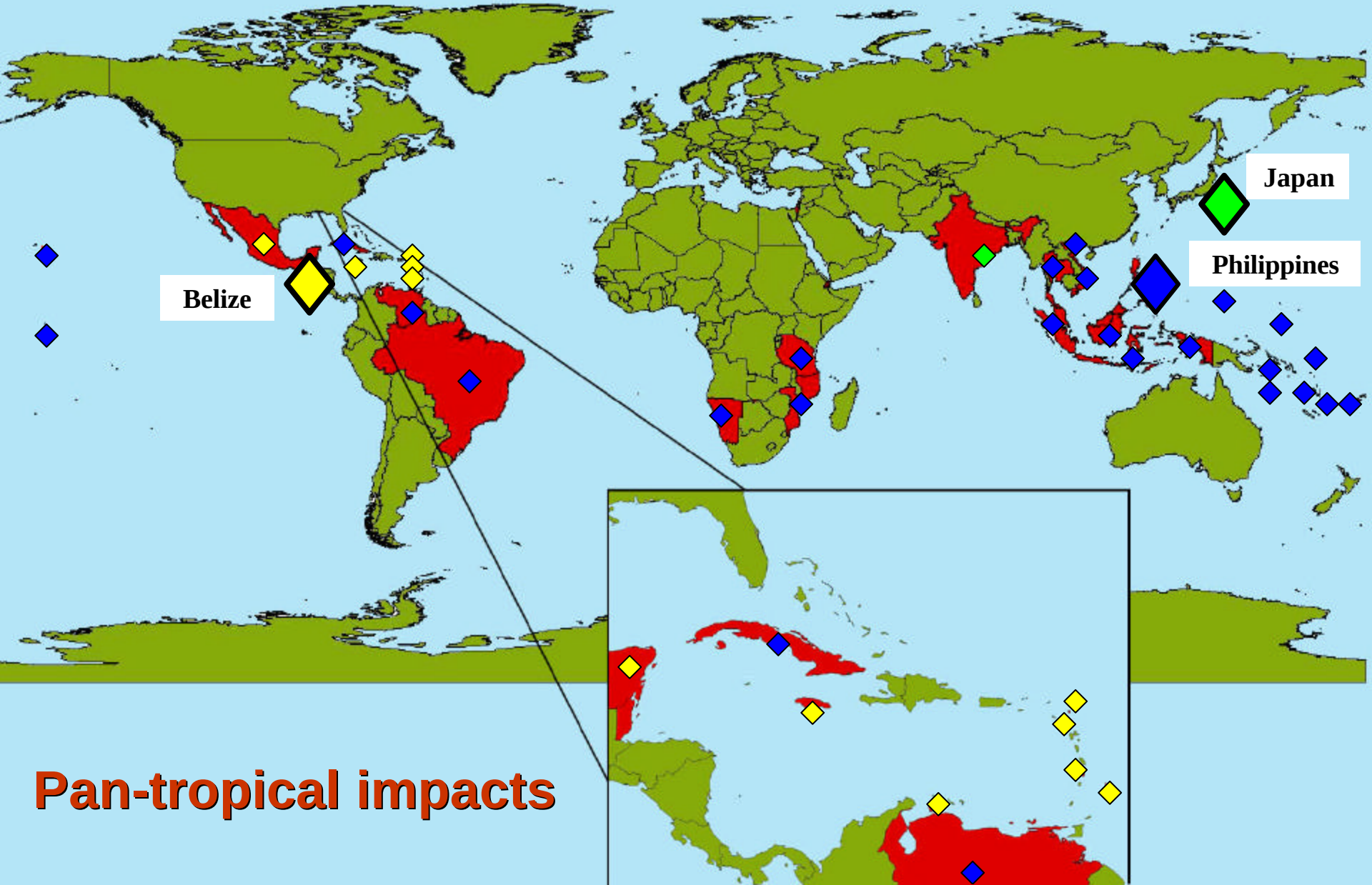
Browse the checklist
View Checlikst in outline form by major taxonomic group.

For example:

Phylum Echinodermata
SubPhylum Eleutherozoa
Class Ophiuroidea
Order Phyrynophiurida
Family Asteroschematidae
Asteroschema Oersted and Luetken, 1856
Asteroschema ajax Clark, 1949
Asteroschema caudatum (Lyman, 1879)
etc.....

Threat of coral diseases

Global Sites of Introduction: *Kappaphycus*



Pan-tropical impacts